

WHAT IS CLAIMED IS:

1. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

a housing including at least two drivers;

an anvil mechanically attachable to the housing and moveable relative to the housing between an extended position and a retracted position;

wherein a first one of the drivers is configured to move the anvil relative to the housing to an intermediate position between the extended position and the retracted position, and wherein a second one of the drivers is configured to move at least a portion of the housing relative to the anvil between the intermediate position and the retracted position.

2. The surgical device of claim 1, wherein the anvil and the housing define first and second clamping faces, respectively, and wherein, when the anvil is in the retracted position, the surgical device is configured to clamp a section of tissue between the first clamping face of the anvil and the second clamping face of the housing.

3. The surgical device of claim 1, wherein the housing includes a cutting element configured to be driven between a retracted position and an extended position by the second driver.

4. The surgical device of claim 1, wherein the housing includes a stapling element configured to be driven between a retracted position and an extended position by the second driver.

5. The surgical device of claim 1, wherein the stapling element includes a staple cartridge that is configured to move axially within the housing between a retracted position and an extended position by the second driver.

6. The surgical device of claim 4, wherein the staple cartridge includes the second clamping face.

7. The surgical device of claim 6, wherein the staple element includes a staple pusher configured to push staples that are stored within respective staple slots of the staple cartridge out of the staple slots and into the anvil.

8. The surgical device of claim 1, wherein the anvil and the housing are configured such that the anvil is axially lockable in the intermediate position relative to the housing.

9. The surgical device of claim 1, wherein the first and second drivers are attachable to respective rotatable drive shafts, the rotatable drive shafts selectively rotated by at least one motor.

10. The surgical device of claim 9, wherein the rotatable drive shafts are selectively rotated under the control of a controller.

11. A surgical device for stapling a section of tissue, comprising:
a staple pusher;

a housing configured to store staples, the housing selectively moveable relative to the staple pusher;

an anvil moveable relative to the staple pusher and the housing, wherein movement of the anvil causes the housing to move relative to the staple pusher.

12. The surgical device of claim 11, wherein the anvil is moveable relative to the staple pusher between a first position, in which the anvil is spaced apart from a clamping surface of the housing and a second position, in which the anvil contacts the clamping surface of the housing.

13. The surgical device of claim 12, wherein the anvil is moveable relative to the staple pusher between the second position and a third position, in which the staples stored in the housing are pushed out of the housing by the staple pusher to be closed against the anvil.

14. The surgical device of claim 13, wherein the movement of the anvil between the second and the third position causes the housing to move relative to the staple pusher.

15. The surgical device of claim 14, wherein the housing is connected to the staple pusher by a shear pin.

16. The surgical device of claim 15, wherein the shear pin is configured to shear when, by the movement of the anvil between the second and the third position, the anvil applies a predetermined amount of pressure on the clamping surface of the housing.

17. The surgical device of claim 16, wherein the housing includes a plurality of staple slots aligned with a corresponding plurality of pusher fingers extending from the staple pusher.

18. The surgical device of claim 17, further comprising a first driver configured to move the anvil relative to the housing and the staple pusher.

19. The surgical device of claim 18, further comprising a cutting element mounted to the staple pusher.

20. The surgical device of claim 19, wherein, when the anvil is moved relative to the staple pusher between the second position and the third position, the cutting element operates to cut tissue positioned between the anvil and the clamping surface of the housing.

21. A surgical device for cutting a section of tissue, comprising:
a cutting element;
a housing having a clamping surface, the housing selectively moveable relative to the cutting element;
an anvil moveable relative to the cutting element and the housing, wherein movement of the anvil causes the housing to move relative to the cutting element.

22. The surgical device of claim 21, wherein the anvil is moveable relative to the cutting element between a first position, in which the anvil is spaced apart from a

clamping surface of the housing, and a second position, in which the anvil contacts the clamping surface of the housing.

23. The surgical device of claim 22, wherein the anvil is moveable relative to the cutting element between the second position and a third position, in which the cutting element is brought into contact with the anvil.

24. The surgical device of claim 23, wherein the movement of the anvil between the second and the third position causes the housing to move relative to the cutting element.

25. The surgical device of claim 24, wherein the housing is connected to the cutting element by a shear pin.

26. The surgical device of claim 25, wherein the shear pin is configured to shear when, by the movement of the anvil between the second and the third position, the anvil applies a predetermined amount of pressure on the clamping surface of the housing.

27. The surgical device of claim 26, further comprising a first driver configured to move the anvil relative to the housing and the cutting element.

28. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

a housing forming a first clamping surface;

an anvil mechanically attachable and moveable relative to the housing along an axis between an extended position and a retracted position, the anvil forming a second clamping surface,

wherein at least a portion of the first and second clamping surfaces are non-perpendicular relative to the axis.

29. The surgical device of claim 28, wherein, when the anvil is in the closed position, the surgical device is configured to clamp a section of tissue between the first and second clamping faces.

30. The surgical device of claim 29, wherein the first and second clamping faces are parallel relative to each other.

31. The surgical device of claim 30, further comprising a first driver configured to move the anvil relative to the housing.

32. The surgical device of claim 31, further comprising:

a second driver,

wherein the housing includes a cutting element configured to be driven between a retracted position and an extended position by the second driver.

33. The surgical device of claim 31, further comprising:

a second driver,

wherein the housing includes a stapling element configured to be driven between a retracted position and an extended position by the second driver.

34. The surgical device of claim 1, wherein the stapling element includes a staple cartridge.

35. The surgical device of claim 34, wherein the staple cartridge defines the second clamping face.

36. The surgical device of claim 35, wherein the staple element includes a staple pusher configured to push staples that are stored within respective slots of the staple cartridge out of the slots and against the anvil.

37. The surgical device of claim 36, wherein the staple pusher includes at least two radially-spaced rows of staple pusher fingers, each row arranged at a different axial position.

38. The surgical device of claim 37, wherein the slots of the staple cartridge define openings in the first clamping face, the openings being arranged in at least two radially-spaced rows aligned with the at least two radially-spaced rows of staple pusher fingers, each row of the openings being arranged at a different axial position.

39. The surgical device of claim 38, wherein the second clamping face defines staple guides configured to close a staple, the staple guides being arranged in at least two radially-spaced rows aligned with the at least two radially-spaced rows of staple pusher fingers, each row of the staple guides being arranged at a different axial position.

40. The surgical device of claim 39, wherein the first and second drivers are attachable to respective rotatable drive shafts, the rotatable drive shafts selectively rotated by at least one motor.

41. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

a housing including a stapling element, the stapling element including a staple cartridge defining a plurality of slots and staples stored within the slots, and a staple pusher having staple pusher fingers aligned with the plurality of slots;

a driver configured to move the staple cartridge and the staple pusher together between a retracted position and an intermediate position, wherein, at the intermediate position, the driver moves the staple pusher relative to the staple cartridge to an extended position.

42. The surgical device of claim 41, further comprising an interference element that is configured to maintain the relative position of the staple cartridge and the staple pusher when the driver moves the staple cartridge and the staple pusher together between the retracted position and the intermediate position.

43. The surgical device of claim 41, wherein the intermediate position is one of a position at which the staple cartridge sufficiently clamps a section of tissue and a position at which the staple cartridge is axially locked in position relative to the housing.

44. The surgical device of claim 41, wherein the intermediate position is a position at which the staple cartridge sufficiently clamps a section of tissue.

45. The surgical device of claim 42, wherein the interference element is a frangible component.

46. The surgical device of claim 42, wherein the interference element is connected to the staple pusher and includes a radially extending rib that maintains contact with a portion of the staple cartridges up to a predetermined pressure.

47. The surgical device of claim 46, further comprising a blade, wherein the radially extending rib of the interference element contacts an oppositely-disposed, radially extending rib of the staple cartridge and the blade.

48. The surgical device of claim 47, wherein, when the predetermined pressure is reached, the radially extending rib of the interference element is caused to travel between the oppositely-disposed, radially extending rib of the staple cartridge and the blade, thereby enabling the staple pusher to move relative to the staple cartridge.

49. The surgical device of claim 48, further comprising an anvil against which the staples are pushed by the staple pusher.

50. The surgical device of claim 49, wherein the first driver is attachable to a rotatable drive shaft, the rotatable drive shaft selectively rotated by at least one motor under the control of a controller.

51. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

a housing;

a staple cartridge positioned at a distal end of the housing and defining a plurality of slots and staples stored within the slots;

a staple pusher positioned proximal to the staple cartridge and having a plurality of staple pusher fingers aligned with the plurality of slots;

a pusher element positioned proximal to the staple pusher and configured to be simultaneously rotated within the housing and distally advanced relative to the staple cartridge, the pusher element having a cam element extending toward the staple pusher such that the cam element sequentially pushes against the plurality of staple pusher fingers.

52. The surgical device of claim 51, wherein the pusher element is keyed to a rotatable member that extends longitudinally towards the staple cartridge.

53. The surgical device of claim 52, wherein the rotatable member is a neck portion of a spider screw element.

54. The surgical device of claim 53, further comprising a nut positioned proximally relative to the pusher element, the nut having an internally threaded bore, the rotatable member being threaded, wherein the internally threaded bore of the nut is in threaded engagement with the rotatable member.

55. The surgical device of claim 54, wherein the nut is keyed to the housing, such that rotation of the rotatable member causes distal advancement of the nut.

56. The surgical device of claim 55, further comprising a bearing between the nut and the pusher element, the bearing providing a substantially frictionless contact between the nut and the pusher element.

57. The surgical device of claim 56, wherein, in order for the staple pusher fingers to completely push the staples out of the slots of the staple cartridge, the pusher element is configured to be rotated more than once.

58. The surgical device of claim 51, further comprising a cutting element positioned distally relative to the pusher element and is configured to be pushed by the pusher element.

59. The surgical device of claim 58, wherein, in order for the cutting element to cut a section of tissue positioned at a clamping face of the staple cartridge, the pusher element is configured to be rotated more than once.

60. The surgical device of claim 52, wherein the rotatable member is configured to be rotated by a first driver, the first driver being selectively rotated by at least one motor under the control of a controller.

61. A sleeve for facilitating the insertion of a surgical device into one of an orifice and a passage of a patient, the surgical device having a distal end defining a cross-section, comprising:

a first portion configured to cover at least a portion of the surgical device;

at least one closure element selectively moveable between an insertion position, in which the at least one closure element tapers to a cross-section that is smaller than the cross-section of the distal end of the surgical device, and a retracted position, in which the surgical device is configured to perform, through the closure elements, a surgical operation in one of the orifice and the passage of the patient.

62. The surgical device of claim 61, wherein the at least one closure element includes a pair of oppositely-disposed closure elements.

63. The surgical device of claim 62, wherein the pair of oppositely-disposed closure elements have a duck-bill shape.

64. The surgical device of claim 62, wherein the pair of oppositely-disposed closure elements are attached to flaps extending from the first portion of the sleeve.

65. The surgical device of claim 61, wherein the at least one closure element includes a ring, wherein, in the insertion position, an axis defined by the ring is substantially perpendicular to a longitudinal axis defined by the surgical device.

65. The surgical device of claim 65, wherein, in the retracted position, the axis defined by the ring is substantially coaxial relative to an axis defined by the surgical device.

66. The surgical device of claim 61, wherein the at least one closure element is moveable into the retracted position by the first portion of the sleeve being moved proximally relative to the surgical device.

67. The surgical device of claim 61, wherein the sleeve is formed from a material having a relatively high lubricity.

68. The surgical device of claim 61, wherein the sleeve is formed from a material that is autoclavable.

69. The surgical device of claim 61, wherein the sleeve is contoured to the shape of the surgical device.

70. A method of at least one of cutting and stapling a section of tissue using a surgical attachment having an anvil and a housing, comprising the steps of:

mechanically attaching the anvil to the housing;

with a first driver, moving the anvil relative to the housing to an intermediate position between an open position and a closed position;

with a second driver, moving at least a portion of the housing relative to the anvil between the intermediate position and the closed position.

71. The method of claim 70, wherein moving the at least a portion of the housing relative to the anvil to the closed position includes clamping a section of tissue between a first clamping face of the anvil and a second clamping face of the housing.

72. The method of claim 71, further comprising the step of driving, with the second driver, a cutting element between a retracted position and an extended position.

73. The method of claim 71, further comprising the step of driving, with the second driver, a stapling element between a retracted position and an extended position.

74. The method of claim 71, further comprising the step of driving, with the second driver, a staple cartridge axially within the housing between a retracted position and an extended position.

75. The method of claim 74, further comprising the steps of:
storing staples within respective staple slots of the staple cartridge;
driving, with the second driver, a staple pusher; and
pushing, with the staple pusher, the staples into staple guides in the anvil.

76. The method of claim 71, further comprising the steps of axially locking the anvil relative to the housing in the intermediate position.

77. The method of claim 71, further comprising the steps of:
attaching the first and second drivers to respective rotatable drive shafts; and
selectively rotating the rotatable drive shafts by at least one motor.

78. The method of claim 77, wherein the selectively rotating step includes selectively rotating the rotatable drive shafts under the control of a controller.

79. A method for stapling a section of tissue, comprising:
storing staples in a housing, the housing being selectively movable relative to a staple pusher;
moving an anvil relative to the staple pusher and the housing, wherein moving the anvil causes the housing to move relative to the staple pusher.

80. The method of claim 79, wherein the moving step includes moving the anvil relative to the staple pusher between a first position, in which the anvil is spaced apart from a clamping surface of the housing, and a second position, in which the anvil contacts the clamping surface of the housing.

81. The method of claim 80, wherein the moving step includes moving the anvil relative to the staple pusher between the second position and a third position, in which the staples stored in the housing are pushed out of the housing by the staple pusher to be closed against the anvil.

82. The method of claim 81, wherein the step of moving the anvil between the second and the third position includes the housing being moved relative to the staple pusher.

83. The method of claim 82, further comprising the step of connecting the housing to the staple pusher by a shear pin.

84. The method of claim 83, further comprising the steps of:
with the anvil, applying a predetermined amount of pressure on the clamping surface of the housing; and
shearing the shear pin such that the anvil moves between the second and the third position.

85. The method of claim 84, further comprising the step of aligning a plurality of staple slots of the housing with a corresponding plurality of pusher fingers extending from the staple pusher.

86. The method of claim 85, wherein the step of moving the anvil relative to the housing and the staple pusher includes moving the anvil with a first driver.

87. The method of claim 86, further comprising the step of, when the anvil is moved relative to the staple pusher between the second position and the third position, cutting with a cutting element tissue positioned between the anvil and the clamping surface of the housing.

88. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

a housing defining a bore;
a trocar shaft disposed through the bore of the housing so as to be moveable relative to the housing; and
an anvil having an anvil shaft that is attachable to the trocar shaft, at least a portion of the anvil shaft being flexible,

wherein a first one of the trocar shaft and the anvil shaft defines a trocar receiving slot, and a second one of the trocar shaft and the anvil shaft includes a trocar configured to be insertable within the trocar receiving slot.

89. The surgical device of claim 88, wherein at least a portion of the trocar shaft is flexible.

90. The surgical device of claim 88, wherein the trocar receiving slot is defined in a cable extension element having an axially-extending bore in communication with the trocar receiving slot.

91. The surgical device of claim 90, wherein the axially-extending bore has a wide portion into which the trocar is insertable and a narrow portion which retains the trocar within the axially-extending bore.

92. The surgical device of claim 91, wherein the first one of the trocar shaft and the anvil shaft includes a biasing element, the biasing element moveable so as to permit insertion of the trocar into the trocar receiving slot, the biasing element configured to bias the trocar towards the narrow portion of the axially-extending bore so as retain the trocar within the narrow portion of the axially-extending bore.

93. The surgical device of claim 92, wherein the biasing element includes a plunger connected to a spring.

94. The surgical device of claim 93, wherein the second one of the trocar shaft and the anvil shaft includes a first portion that is configured to seat against the narrow portion of the axially-extending bore of the cable extension element.

95. The surgical device of claim 94, wherein the first portion is spherical in shape.

96. The surgical device of claim 95, wherein the trocar shaft is moveable relative to the housing between an extended position and a retracted position by operation of at least one driver within the housing.

97. The surgical device of claim 96, wherein the driver is attachable to a rotatable drive shaft, the rotatable drive shaft selectively rotated by at least one motor.

98. The surgical device of claim 97, wherein the rotatable drive shaft is selectively rotated under the control of a controller.

99. A surgical device for at least one of cutting and stapling a section of tissue, comprising:

- a housing defining a bore;

- a trocar shaft disposed through the bore of the housing so as to be moveable relative to the housing, wherein at least a portion of the trocar shaft is flexible; and

- an anvil attachable to the trocar shaft and configured to be moveable relative to the housing by movement of the trocar shaft.

100. The surgical device of claim 99, wherein the anvil includes an anvil shaft, the anvil shaft defining a trocar receiving slot, and the trocar shaft including a trocar configured to be insertable within the trocar receiving slot.

101. The surgical device of claim 100, wherein the trocar receiving slot is defined in an anvil sleeve having an axially-extending bore in communication with the trocar receiving slot.

102. The surgical device of claim 101, wherein the axially-extending bore has a wide portion into which the trocar is insertable and a narrow portion which retains the trocar within the axially-extending bore.

103. The surgical device of claim 102, wherein the trocar shaft is moveable relative to the housing between an extended position and a retracted position by operation of at least one driver within the housing.

104. The surgical device of claim 103, wherein the driver is attachable to a rotatable drive shaft, the rotatable drive shaft selectively rotated by at least one motor.

105. The surgical device of claim 104, wherein the rotatable drive shaft is selectively rotated under the control of a controller.